

Toxin Sensing for Live Cell by On-line Monitoring Polymeric Nanopillar Arrays

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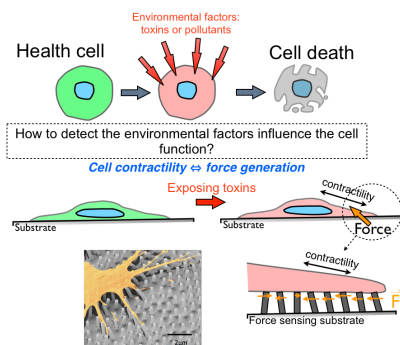
Motivation

Many environmental factors such as toxins or pollutants influence cell function even long before they cause cell death.

Many environmental toxins interfere with cell homeostasis and thereby impact cell **contractility**.

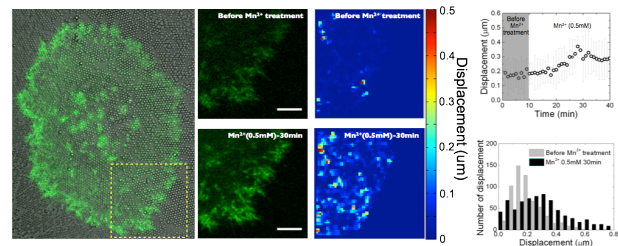
Impairing any of these nanosystems will affect cell contractility: blocking of ion channels, metabolic factors leading to ATP production, factors impacting cytoskeletal components or motor function

Probing for changes in cell contractility using a nanopillar array is thus a rapid way of interrogating changes that affect the health of a cell

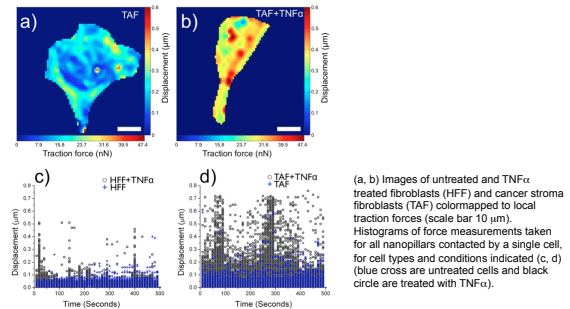


The Effect of Additives or Toxins on Cell Contractility

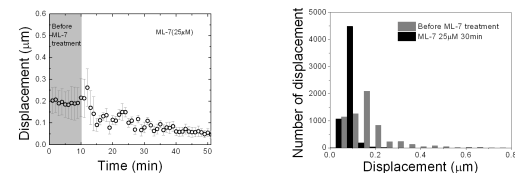
Activation of Integrin of cell by a manganese (Mn^{2+})



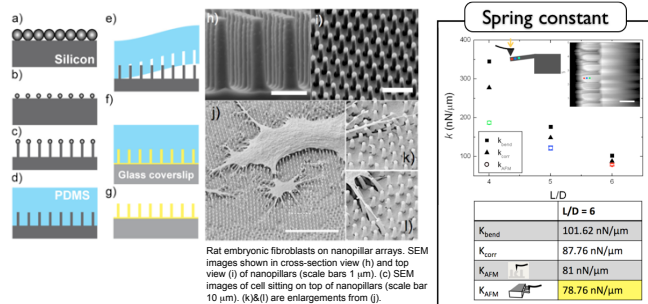
The Effect of a Cytokine on Cell Contractility: Tumor Necrosis Factor alpha (TNF α)



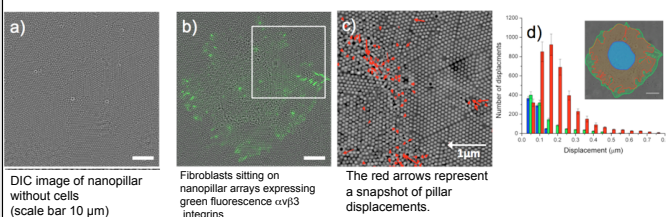
Inhibition of cell contractility by a toxin (ML-7)



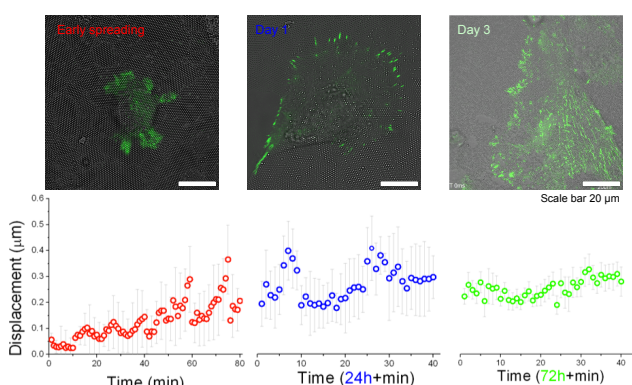
Fabrication of force sensor by using elastic nanopillaar arrays



Force distribution for single cell Sensing by imaging the deflection of nanopillars



Long-term monitoring of cell contractility



Summary

A new nanopillar platform was developed for on-line and long-term monitoring of cells.

Fabrication nanopillar by using molding process are suitable to integrate on many different types of substrates. Using high aspect ratio (1:6) and dense (1.56 pillar/ μm^2) nanopillar arrays are allowed having more precise force measurement.

Preliminary studies were conducted to probe for the effect of additives or toxins on cell contractility

Future Directions

Characterization of concentration-time dependencies of various toxins on cell contractility

Integration of our assay into the LiveSense System

Development of simple read-out optics

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